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# Method and Equipment for BULK TREATMENT OF GRAIN AGAINST INSECTS

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U. S. DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service
Market Quality Research Division

## PRECAUTIONS

To protect the ultimate consumer of food crops and animal products, the use of pesticides is regulated under the Federal Insecticides, Fungicides, and Rodenticides Act and the Federal Food, Drug, and Cosmetic Act. The rate and method of application and any resulting residues must comply with the requirements of these two Acts. Products in violation of the Food, Drug, and Cosmetic Act are subject to Federal action. If the insecticides are used according to the instructions given in this publication, there should be no violation of the laws.

The established tolerances, in parts per million, of the insecticides recommended in this publication are:

| *Insecticide* | *Grain* | *Tolerances p.p.m.* |
|---|---|---|
| Pyrethrum | Oats | 1 |
| | Sorghum | 1 |
| | Other grains | 3 |
| Piperonyl butoxide | Oats | 8 |
| | Sorghum | 8 |
| | Other grains | 20 |
| Malathion | All grains | 8 |

## Use Carefully

Insecticides are poisonous. They should be used only when needed, and should be handled with extreme care. The directions and precautions on the container label should be followed carefully.

When handling or mixing a concentrate of any insecticide, avoid spilling it on the skin and keep it out of the eyes, nose, and mouth. If any is spilled, wash it off the skin and change clothing immediately. If it goes in the eyes, flush with plenty of water for 15 minutes and get medical attention.

The insecticides mentioned in this report, pyrethrum, piperonyl butoxide, and malathion, can be used safely without special protective clothing or devices, provided they are in dilute dusts or water sprays.

Washington, D.C. October 1962

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## Method and Equipment for

# BULK TREATMENT OF GRAIN AGAINST INSECTS

*By the Stored-Product Insects Branch,*
*Market Quality Research Division, Agricultural Marketing Service* [1]

### Protectants and Tolerances

Research and actual use during the last few years have shown that grain can be protected against insect infestation by applying a protective treatment at the time of storage. The insecticides that have been approved for use as protectants on grain are malathion and synergized pyrethrum. A tolerance of 8 p.p.m. (parts per million) has been established for malathion by the Food and Drug Administration. The pyrethrins are synergized with piperonyl butoxide at a ratio of 1 part of pyrethrins to 10 parts of piperonyl butoxide. The tolerances for these are 3 p.p.m. of pyrethrins and 20 p.p.m. of piperonyl butoxide for most grains, and 1 p.p.m. of pyrethrins and 8 p.p.m. of piperonyl butoxide for oats and grain sorghum.

For the protection of stored grain such as wheat, oats, rough rice, corn, rye, barley, and grain sorghum, 1 pint of 57-percent premium-grade malathion emulsifiable liquid in 2 to 5 gallons of water should be applied to each 1,000 bushels of grain; or 1 gallon of emulsifiable concentrate containing 6 percent of pyrethrins and 60 percent of piperonyl butoxide in 29 gallons of water should be applied at the rate of 5 gallons to each 1,000 bushels of grain.

The equipment and methods described here may also be used for the bulk treatment of unshelled peanuts. See "Insect Prevention and Control in Farmers Stock Peanuts," AMS–453, for information on the rates, methods, and frequency of application of insecticides.

[1] The Department of Agriculture wishes to acknowledge the assistance of William B. Gehl of the American Cyanamid Company, who designed and tested the apparatus described in this publication.

BN–16003

FIGURE 1.—Power sprayer that consists of a nylon roller pump, equipped with leather seals (leather is not affected by the action of the insecticide), ⅓- to ½-horsepower, 110-volt motor, 8-foot suction hose with removable suction strainer, 7-foot bypass hose, ½-inch pressure regulator, pressure gage, shutoff valve, 20-foot pressure hose, spray nozzle, and nozzle bracket, all mounted on a steel base, which is attached to a barrel of the insecticide.

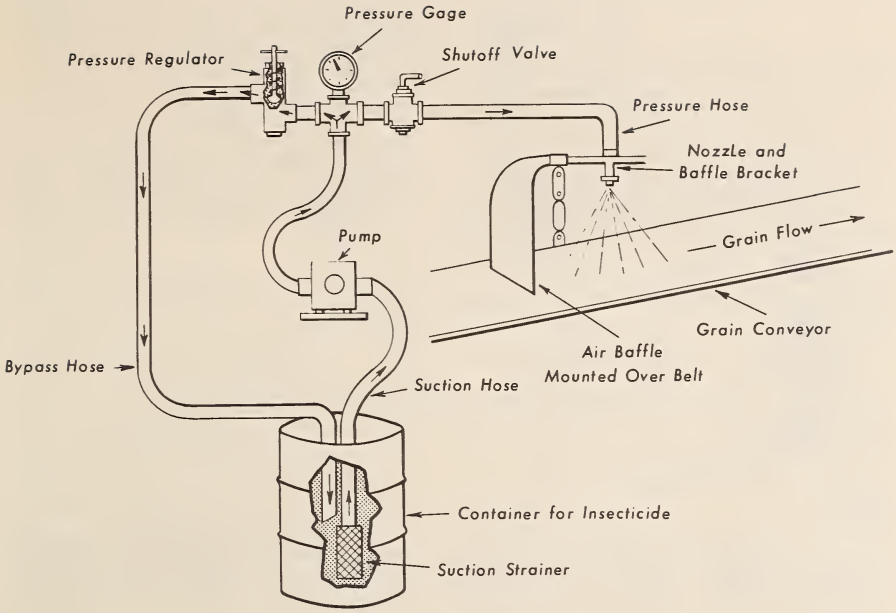


FIGURE 2.—Installation diagram for grain protectant sprayer, using single nozzle.

## Equipment Required

Any low-pressure sprayer that can be calibrated to deliver a known volume of liquid is suitable for applying these protectants. This includes hand sprayers and both electric and gasoline-engine-driven power sprayers.

An economical power sprayer is illustrated in figure 1.

Because only small amounts of solution are being used per hour, it is advisable to use a low-gallonage pump and a small motor. In some areas, insurance terms require totally enclosed fan-cooled motors in grain elevators.

The spray pressure should be as low as possible; 10–20 p.s.i. (pounds per square inch) is preferred. The lower the pressure, the larger are the spray droplets. The larger droplets fall onto the grain and are less likely to drift off into the air.

It is important to have the correct size of orifice in the sprayer nozzle. The nozzle output can be varied to meter the insecticide properly for any number of bushels of grain per hour. Every manufacturer of spray nozzles has nozzle charts giving the capacity in gallons per minute and the spray angle for each size of orifice.

Figure 2 is a diagram for installation of the pump and spraying system for the insecticide. Sometimes, to obtain the proper application rate or to get complete coverage on a wide belt, it is necessary to use two or more nozzles (fig. 3).

## Installation

When spraying grain on a moving belt, the nozzle should be 6 to 8 inches above the belt, and the spray should go against the flow of grain (fig. 4). The nozzle should be set in such a manner that the spray pattern covers the entire width of the stream of grain. It is extremely important to eliminate the air

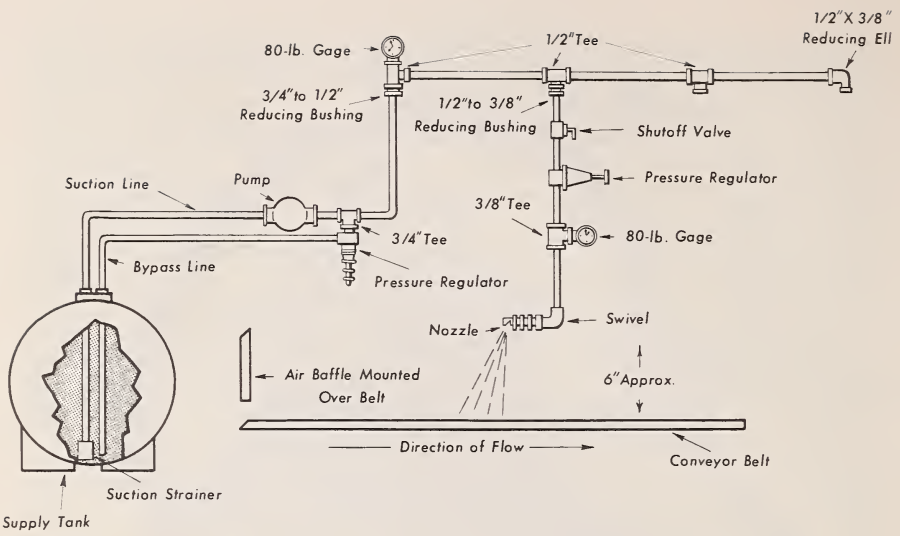


FIGURE 3.—Piping diagram for multiple-conveyor or multiple-nozzle installation of grain protectant sprayer. The second and third nozzle drops are duplicates of the one shown.

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FIGURE 4.—View of grain on moving belt as it is sprayed with solution of insecticide. Note that baffle prevents air movement from disrupting spray pattern.

movement above the belt around the spray nozzle, to keep the spray from drifting off into the air instead of onto the grain. This can be done by placing a baffle across the belt several inches above the grain. This baffle deflects the air and allows the spray to fall directly on the grain.

### Method of Calibration

After the turning rate of the grain passing on the belt or conveyor is known (the amount of grain passing a point in a given time), choose from the manufacturer's chart a nozzle that will deliver the gallons per hour needed in the range of 10 to 20 p.s.i.

For example, if the turning rate of the grain is 500 bushels per hour, and the amount of insecticide to be applied is 2 gallons per 1,000 bushels, then a nozzle with capacity of 1 gallon per hour at 15 p.s.i is required.

From the manufacturer's chart, choose a nozzle that will deliver 1 gallon per hour at as low pressure as possible. Install this nozzle on the sprayer and, using plain water, operate the sprayer at the pressure recommended. Catch all the water delivered in 10 minutes. Weigh or measure the amount collected, and multiply this by 6 to determine the amount delivered per hour.

The output of the nozzle will vary slightly from the rated output. If the amount collected was more than a gallon, decrease the pressure slightly and rerun the test. If the amount collected was less than a gallon, increase the pressure slightly and rerun the test. Do this until the sprayer is delivering the correct amount.



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